

## Introduction

The Army is continually seeking ways to shorten the materiel acquisition cycle to be better able to respond to today's rapidly evolving threats. One of the organizations dedicated to this mission is the Edgewood Chemical Biological Center's (ECBC's) Engineering Services Business Unit (ESBU), located at the Soldier and Biological Chemical Command (SBCCOM), Aberdeen Proving Ground, MD. The ESBU is credited with quickly and efficiently fielding improved chemical and biological (CB) defense equipment, especially during contingencies such as Operations Desert Storm and Noble Eagle. Its approach is exemplified by the recent rapid reconfiguration and fielding of eight trailer-mounted biological point detection systems to monitor the air around a critical Defense installation.

## Capabilities

The ESBU operates the Computer Aided Engineering (CAE) and Experimental Fabrication (X-Fab) Team facilities at ECBC. Together, this team includes more than 50 engineers, scientists, technicians, specialists, and craftsmen. The team can be mobilized to design, develop, prototype, and produce equipment on short notice, driven by schedule, cost, and performance. The team's strength lies in its ability to link virtual design, modeling, and prototyping capabilities with virtual testing, which eliminates the need for costly physical mock-ups.

Various designs can be explored analytically by computer until performance and configuration are optimized. The final computerized design can then be reduced to engineering drawings and provided directly to the model shop where master craftsmen can immediately "bend metal" to fashion prototypes and even engage in small-scale production.

The drawings and specifications can also be translated instantly into part of the technical data package for the item. Their application of the "engineering-for-production" concept allows the team to bypass incremental design changes and incorporate expertise from the shop floor with virtual design and test. This allows the team to proceed directly to the best manufacturable product that meets the needs of the customer while being mindful of

# FASTER FIELDING OF MISSION-CRITICAL EQUIPMENT

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logistics and sustainability issues. Lead time and overall development costs are also reduced as a result of this integrated approach.

## A Case Study

The need for early detection of biological threats has never been greater than since the anthrax incidents that followed the terrorist attacks of September 11, 2001. The Joint Program Office for Biological Defense has been developing the Joint Biological Point Detection System (JBPDS) as the next-generation system to meet those needs for all the Services. The JBPDS is the successor to the Army Biological Integrated Detection System, the Navy Interim Biological Agent Detector, and, eventually, the Joint Portal Shield Network Sensor System.

The JBPDS provides an increase in the number of agents that can be identified over previous systems and decreases detection and identification time, while increasing detection and identification sensitivity. With two operational assessments already completed, the JBPDS holds great promise for detecting and presumptively identifying biological warfare agents faster and with greater sensitivity than existing systems. Platform-specific variants of the JBPDS include versions for Navy ships, Army and Marine Corps tactical vehicles, and a man-portable version for the Air Force and Marine Corps.

In October 2001, the timeline for fielding the JBPDS was shortened considerably when the Deputy Secretary of Defense directed that CB detection and

identification equipment be procured for protection of high-priority Defense sites. The JBPDS, because of its capacity for full automation and lower cost of operation than existing systems, was specifically identified for fielding.

To meet this directive, the Product Manager (PM), JBPDS turned to the ESBU (the CAE/X-Fab Team) with a challenging set of constraints: this JBPDS variant had to look nonmilitary, be capable of remote stand-alone operation, be capable of rapid movement and deployment, and meet Army standard safety and human factor requirements. Eight fully configured systems were required, and it all had to be done in 4 weeks.

After receiving the mission, a team of PM, JBPDS and ESBU personnel immediately gathered and decided that a commercial utility trailer would be the best platform. This configuration became the JBPDS Homeland Defense (HLD) Trailer. The trailer chosen by the team is a 12-foot commercial box trailer with a gross weight of 3,500 pounds. The design called for the trailer to be fitted with two compartments. The forward compartment would contain the Basic Biosuite Unit of the JBPDS, a refrigerator (for consumable storage), a generator control panel, an operator station, and stowage space. The rear compartment would contain a 10-kilowatt generator, batteries, a fire extinguisher, and lighting. The commercial trailers in the process of being fitted for the JBPDS are shown in the photo on Page 30.

Commercial trailers being fitted for the JBPDS



## Conclusion

The successful, rapid development and deployment of the JBPDS HLD configuration is a standout example of the synergistic benefits made possible by the close teaming of materiel developers with Army engineering centers. The ESBUs CAE/X-Fab Team applies an approach to design and fabrication that integrates virtual design with the expertise of master craftsmen. This approach drastically reduces the time and expense to get urgently needed equipment to the field. The rapid deployment of eight newly configured JBPDS systems in the short span of 4 weeks is the latest in a series of successes for the CAE/X-Fab Team. It is also testament to the value that the broad skill base found in Army engineering centers can bring to the materiel development and acquisition mission.

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## Challenges

The challenges to the ESBUs were numerous in that the power supply, specialized ventilation, electrical system, sensor ports, and environmental control unit had to be installed in each trailer to support the various components of the JBPDS. Emergency backup power had to be provided to support the generator and associated fuel tank and exhaust ports. Interface panels were also installed to support communication links as well as the capability to provide power from an external line power supply.

To ensure that the necessary components could be fabricated, CAE/X-Fab master tool and die makers were pulled from the shop floor and made part of the design team, where their experience was integrated with the design strategy to guarantee parts manufacturability. Additional flexibility was built into the design so that improved biodetector units could be swapped in the field. However, in the short timeframe of this effort, the CAE/X-Fab Team did not even have an actual biodetector unit to help design the system; they were employed elsewhere.

Personnel from PM, JBPDS worked with the design team and provided recommendations based on their operational expertise. They were impressed to see parts coming off the shop floor, sometimes being assembled with empty spaces left for parts that were not yet built. The CAE/X-Fab Team's ability to accurately model the components in virtual space allowed for rapid

parallel fabrication and installation outside the expected sequence.

The biggest challenge in developing the HLD Trailer was time. However, by Nov. 26, 2001, just 4 short weeks after ECBC received the request, all eight trailers were completely outfitted. But the ESBUs work was not yet finished. Prominent among the operational requirements for the JBPDS HLD systems were operability, reliability, and safety of its operators, including civilian and contractor personnel. A safety evaluation was conducted to minimize any potential hazards to the operators. The results of the evaluation revealed how thoroughly the ESBUs team had considered operability in their design because no operational hazards were identified. Safety recommendations were limited to the addition of labels and guidelines on how to unload the HLD Trailer during transport.

Even then, the ESBUs could not rest on its laurels. On Nov. 20, 2001, the PM, JBPDS accepted an additional task to integrate the Automatic Chemical Agent Detector Alarm (ACADA) within the JBPDS HLD Trailer. Thus, the same JBPDS computer control display would allow an operator to monitor the ACADA. ESBUs and PM, Nuclear, Biological and Chemical Defense personnel successfully procured and installed the ACADAs. Much of the work had to be performed onsite without interrupting the ongoing biological detection mission. By Nov. 28, 2001, JBPDS and contractor team personnel had installed the JBPDS HLD Trailers around the Defense site.